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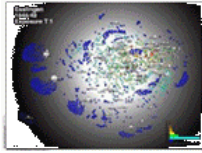
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Abstract:

This paper addresses typological relationships among kinship terminologies determined from structural differences in the way kin terms are organized as systems of concepts. Viewing a terminology as a system of concepts makes evident the generative logic of a terminology that starts with properties shared across several terminologies and eventually includes properties specific to a single terminology. These structural properties lead to a typology in which structural differences between terminologies form the branch points. The typology highlights two primary dimensions along which terminologies may be distinguished: (1) structural differences between terminologies and (2) variation in the morphology of the lexemic form of kin terms. Variation in the former relates to change constrained in the cultural domain and change in the latter relates to change constrained in the linguistic domain.

A New Approach to Forming a Typology of Kinship Terminology Systems From Morgan and Murdock to the Present

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This paper addresses typological relationships among kinship terminologies determined from structural differences in the way kin terms are organized as systems of concepts. Viewing a terminology as a system of concepts makes evident the generative logic of a terminology that starts with properties shared across several terminologies and eventually includes properties specific to a single terminology. These structural properties lead to a typology in which structural differences between terminologies form the branch points. The typology highlights two primary dimensions along which terminologies may be distinguished: (1) structural differences between terminologies and (2) variation in the morphology of the lexemic form of kin terms. Variation in the former relates to change constrained in the cultural domain and change in the latter relates to change constrained in the linguistic domain.

Introduction

The typology frequently used for kinship terminologies traces back to distinctions made by Lewis Henry Morgan, Robert H. Lowie, Peter Kirchhoff, Leslie Spier and George Peter Murdock. The typology is derived from difference in the ways that kin terms identify or categorize what are presumed to be primary genealogical relations. Morgan (1871) made a division between descriptive versus classificatory terminologies according to the way the terminology incorporates lineal and collateral genealogical relations. Descriptive terminologies were said to distinguish lineal from collateral relatives and classificatory terminologies were those that did not. However, ambiguity arises in this definition, as noted by Morgan in his discussion of Eskimo terminologies (pp. 267-277), when lineal and collateral positions are distinguished in the middle three generations but not for more distant generations so that, for example, the child of one's 'niece'/'nephew'—a collateral relative, is referred to as 'granddaughter'/'grandson'—a lineal relative.

Lowie (1928) (and independently Kirchhoff [1932]; see Murdock [1968] and Trautmann [1981:83]) added a parallel/cross contrast derived from Kroeber (1909) to Morgan's lineal/collateral distinction and worked out a four-part division of terminologies based on distinctions made in the parental generation. He referred to his four-part division by the expressions Generation, Bifurcate Merging, Bifurcate Collateral and Lineal terminologies.¹ Of these, Generation and Bifurcate Merging fit in with Morgan's classificatory terminologies and Bifurcate Collateral and Lineal with his descriptive termi-

nologies. Subsequently, Murdock (1949), building from the cross-cousin distinctions used by Lowie (1928) to form a typology of kinship terminologies, focused on the differences in kin terms for genealogically close kin in ego's generation. He added Sudanese and Eskimo terminologies to the four terminology types—Hawaiian, Iroquois, Crow and Omaha—discussed by Lowie. Murdock's six types are based on differences in kin terms for genealogical sibling and cousin relations, with each type named for an exemplar society having that kind of terminology. Despite explicit definitions, these typologies are based on only a few kin terms from one or two generations and so the same terminology may be classified differently, depending on the choice of the generation for the kin terms used in the classification.

The intersection of Morgan's two types with Lowie's four groups and Murdock's six groups yields the following organization for these typologies: Descriptive—includes Sudanese (a Bifurcate Collateral terminology with different terms for each kind of cousin) and Eskimo (a Lineal terminology with a single term for cousins who are all distinguished from siblings) and Classificatory—includes Hawaiian (a Generation terminology in which siblings and cousins are not distinguished), Iroquois (a Bifurcate Merging terminology with parallel cousins distinguished from cross cousins), Crow (a Bifurcate Merging terminology similar to Iroquois, but without a distinction between father's sister and father's sister's daughter), and Omaha (a Bifurcate Merging terminology similar to Iroquois but one in which mother's brother and mother's brother's son are not distinguished). Subsequently, the Iroquois class of terminologies in Murdock's (1949) classification was divided into Iroquois versus Dravidian terminologies based on an analytical (etic) difference in these terminologies between the way parallel and cross relations were distinguished. More recently, refined subdivisions of Murdock's six classes have been made (see Dziebel 2007:211-254 and Pericliev 2011:20-127), including Murdock's (1970) own, more extensive typology derived from over 1000 terminologies.

The classification system has substantial drawbacks since it is based on class definitions that incorporate a mix of structural properties such as lineal versus collateral relations and genealogical properties such as the way genealogical cousins and siblings are distinguished terminologically. Even more problematic, the definitions for the types of terminologies refer to surface differences in terminologies and not to the structural properties leading to the structural form of a terminology. As noted by David Kronenfeld (2004: 260): "The kinds of attributes or information that structure some contrasts between types are quite different from the kinds that structure other contrasts." In addition, the distinctions used by Murdock to define his types are not adequate as terminologies are classed together that are obviously dissimilar from each other. The !Kung san and the American/English terminologies are both classified as Eskimo terminologies, for example, yet the two terminologies differ on almost every aspect other than superficially similar distinctions among genealogical cousins, uncles and aunts. Other terminologies, such as the Shipibo terminology, do not fit into the typology system at all (Behrens 1984).

Rather than using surface differences among terminologies based on mapping kin terms onto genealogical relations, a typology should be based on the structural properties that generate those surface differences. The generating processes are where we find "na-

ture's joints" to which a typology should conform in order for it to satisfy the hallmark of being a better classification (Kronenfeld 2006). Distinctions made at the surface level of kin terms focus, instead, on the result of structuring processes. Consequently, the commonly used method of distinguishing among kin terms by mapping them onto genealogical relations will group together as similar what are structurally different terminologies when different structuring processes yield kin terms with similar genealogical definitions. In addition, the genealogical distinctions may not be sensitive to differences in structuring processes. To deal with these considerations, we need to first determine what the generative, structural properties are and then classify terminologies according to differences arising from the structuring processes that have been identified.

Structural Properties of Kinship Terminologies

The structural properties we need for classifying terminologies can be derived from the way users of a kinship terminology determine kin relations directly from the kin terms without necessary reference to genealogy; that is, from the way a kinship terminology is a cultural construct with an internal logic that makes it possible to use kin terms computationally in a logically consistent manner as a way to determine kin relations among individuals. This does not mean that genealogy is irrelevant to understanding kinship systems, only that there is a logic that organizes kin terms into an idea system that does not derive from genealogical relations. The cultural idea system encapsulated in a kinship terminology does relate back to genealogy through mapping kin terms to genealogical categories, but the mapping is constructed from the properties of the kin term idea system and not from the properties of a genealogical space, as has already been demonstrated (see Read 2001, 2007), and the genealogical categories associated with kin terms are predictable from the logic that organizes the kin terms into an idea system (see Read 2001: Figure 5, 2007:338-339, Figure 3).

The way kinship relations are calculated directly by users of a kinship terminologies from kin term concepts was expressed succinctly by Anthony Good (1981) in his discussion of the terminology for the Kondaiyankottai Maravar of India: "If ego knows what term to use for alter A, and also knows what term A uses for alter B, he can easily work out what term he himself should use for B" (Good 1981:113). Other ethnographers (e.g., Behrens 1984; Dousset 2008; Levinson 2006; Radcliffe-Brown 1913, among others) have made similar observations about calculating kin term relations between two persons by referring to the kin term relation each has to a third person.

We can formalize this kind of computation by defining a kin term product (Read 1984) as follows: "If ego (properly) refers to alter 1 by the kin term L and alter 1 properly refers to alter 2 by the kin term K, then by the product of K and L, denoted $K \circ L$, is meant a kin term (if any) ego properly uses to refer to alter 2." To illustrate, using American/English kin terms, if ego (properly) refers to alter 1 as *uncle* (= L) and alter 1 properly refers to alter 2 as *daughter* (= K), then ego properly refers to alter 2 as *cousin* (= $K \circ L$) and so *daughter* of *uncle* is *cousin*, or more formally, *daughter* \circ *uncle* = *cousin*, as shown in Figure 1.

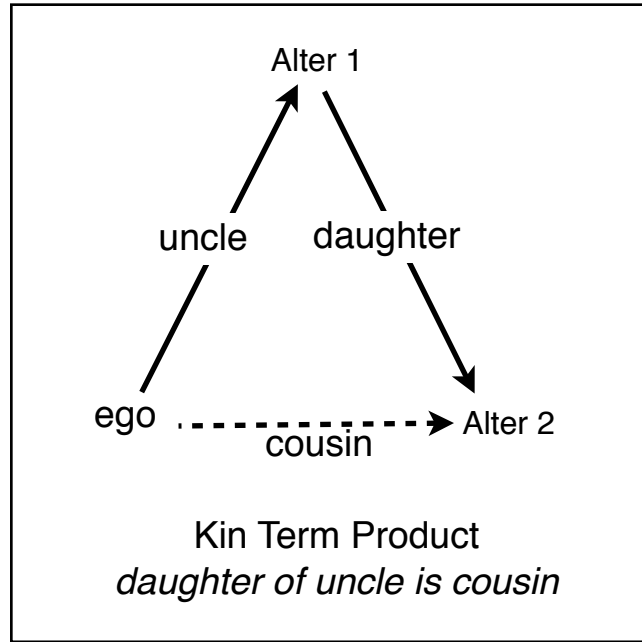


Figure 1: Kin term product equation for the kin terms *uncle*, *daughter* and *cousin*.

From the kin term product we may “read off” the relative product, “my uncle’s daughter is my cousin.” Whereas a relative product has to do with the product of genealogical relations between persons constructed from parent-child and spouse relations, the kin term product is defined over kin terms. The kin term product calculations make it evident that “there are formal, structural relationships in the terminology which do not derive from particular, behavioral uses to which the terminology may be put. ... [and so] the structure should not be represented by means of a pseudo-genealogical diagram” (Good 1981:113). Instead, we can display diagrammatically the structural relationships among the kin terms by computing all possible kin term products using the kin terms that express the “relationships ... within the elementary family, viz. The relation of parent and child, that of husband and wife, and that between siblings” (Radcliffe-Brown 1950:6; see also Murdock 1949:93-94). For the American/English terminology (hereafter AKT), we obtain, through elicitation (Leaf 1971, 2006), kin term product equations that determine the structure of the AKT by starting with the concept of *self* and then repeatedly taking products with the primary kin terms *father*, *mother*, *son*, *daughter*, *husband* and *wife*. For example, we elicit the kin term *grandfather* from English speakers by asking: If ego refers to alter 1 by the kin term *father* and alter 1 refers to alter 2 by the kin term *father*, then what is the kin term ego uses properly to refer to alter 2? When we are informed that ego would refer to alter 2 by the kin term *grandfather*, we have elicited the kin term product equation *father of father = grandfather*. Similarly, we find that *father of mother = grandfather* by asking: If ego refers to alter 1 by the kin term *mother* and alter 1 refers to alter 2 by the kin term *father*, then what is the kin term ego uses to refer to alter 2? Because we are informed that ego would refer to alter 2 by the kin term *grandfather*, we now have the kin term product equation *father of mother = grandfather*. We continue in

this manner and elicit other kin term product equations such as: *mother of father = grandmother = mother of mother*, *son of father = brother = son of mother*, *daughter of father = sister = daughter of mother*, and so on.

We can elicit the kin term product equations systematically, beginning with the kin terms that express the primary relations as identified by Radcliffe-Brown. Thus we begin by asking, “If ego refers to alter 1 by a primary kin term and alter 1 refers to alter 2 by a primary kin term, then what is the kin term, if any, ego uses to refer to alter 2.” The reply is likely to be a kin term that is not one of the primary kin terms. We continue in this manner, systematically, until we have formed all possible questions using the primary kin terms both for reference to alter 1 and for reference to alter 2. For any kin term, L, received in reply that is not a primary kin term, we then ask all possible questions of the form “If ego (properly) refers to alter 1 by the kin term L and alter 1 (properly) refers to alter 2 by a primary kin term K, then what is the kin term ego (properly) uses to refer to alter 2?”, where L is one of the kin terms that has just been elicited and K is one of the primary kin terms. We will receive as a reply either (1) a kin term we have not elicited so far; e.g., for the AKT, when we use the kin term L = *grandfather* and K = *son* and ask “How do you refer to *son of grandfather*?”, we would obtain the previously unsolicited kin term *uncle*, (2) a kin term we have already elicited; e.g., when we use the kin term L = *cousin* and K = *son*, we may receive the reply, *cousin*, an already elicited kin term, or (3) in some cases the reply may be that there is no such kin term; e.g., when we use the kin term L = *father-in-law* and K = *father*, then we would receive the reply that there is no kin term corresponding to the kin term product *father of father-in-law*. For a sequence of kin terms such as *grandfather*, *great grandfather*, *great great grandfather*, ... in the AKT, it would be evident that the kin term sequence continues with a regular pattern for forming each of the kin term expressions. In this way, the elicitation procedure makes it possible not only to determine the kin terms making up the kinship terminology, but also its conceptual boundaries.

Along with the kin terms making up the terminology, we have also elicited a structure for the terminology through the products with the primary kin terms. We can display this structure by starting with a node labeled by the *self* concept, then letting each of the primary kin terms and each of the elicited kin terms be a node in the graph of the structure. We show the connections among the nodes by drawing an arrow from a kin term L to the kin term elicited when forming a kin term product of the kin term L with a primary kin term K. We distinguish products with different primary terms through an arrow form (shape of arrow head, kind of line used for the shaft) specific to a single primary kin term. For example, corresponding to the kin term product equation *son of father = brother*, we draw an arrow corresponding to the primary term *son* from the kin term *father* to the kin term *brother*, as shown in Figure 2.

Figure 2 shows the kin term map we obtain for the AKT from this elicitation procedure. All kin terms are represented by a node in the structure and the arrows from any kin term, L, point to the kin terms obtained when taking a product with the primary kin terms and the kin term L. For example, arrows corresponding to *son* and *daughter* point

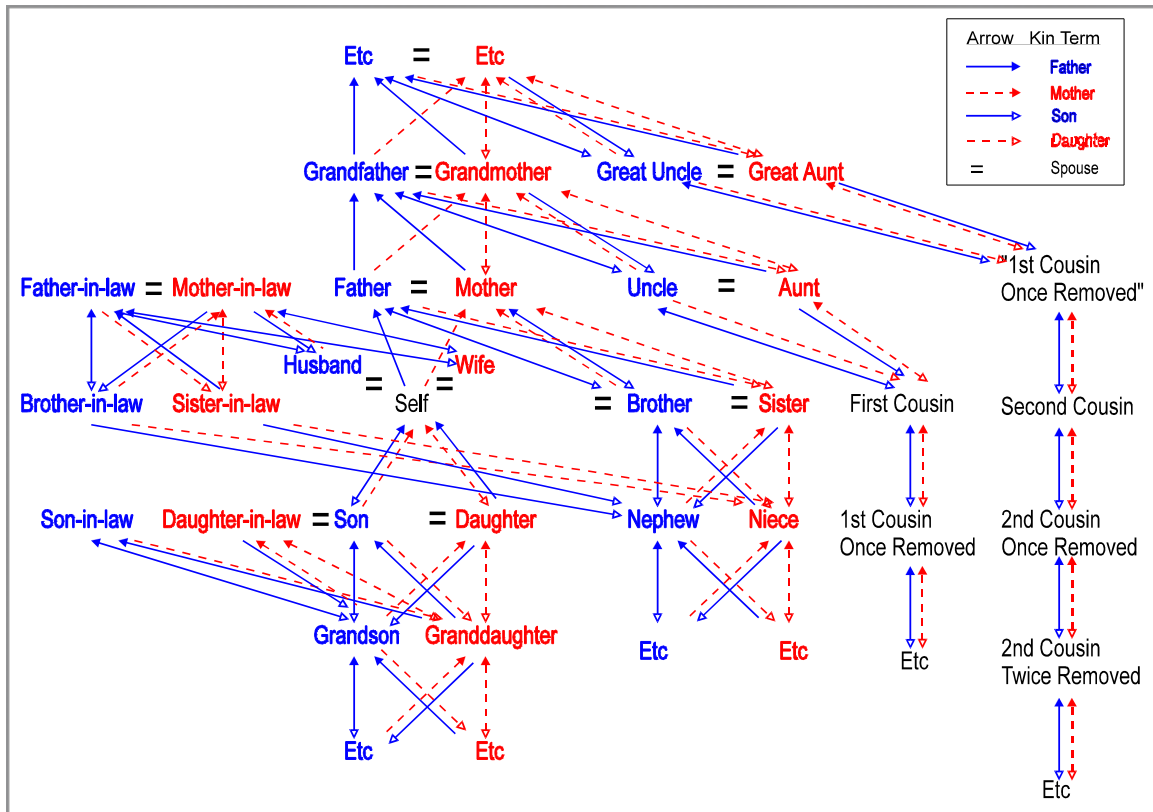


Figure 2: Kin term map for the American Kinship Terminology, based on the primary kin terms father, mother, son, daughter, and spouse. Male terms are black, female terms are grey, and neutral terms are bold and in black (here and in the other figures). Etc indicates that the kin term map continues in the same way without any structural changes.

from the kin term *aunt* to the kin term *1st cousin* due to the fact that (*son* or *daughter*) of *aunt* is *1st cousin*. The equal sign, used to indicate a product with the spouse term, links *aunt* and *uncle* since *spouse* of *aunt* is *uncle* and *spouse* of *uncle* is *aunt*.

By comparing kin term maps for different terminologies we make evident structural differences among kinship terminologies. The kin term map for the Shipibo terminology (see Figure 3; the Shipibo are a horticultural group in eastern Peru) differs strikingly from the kin term map for the AKT (compare Figures 2 and 3) and we can immediately see structural differences such as the horizontal symmetry that only occurs in the Shipibo terminology versus the “ladder-like” vertical structures for the lineal terms and the descending collateral terms in the AKT. The kin term map for the !Kung san terminology (see Figure 4) is equally striking in its differences from the kin term maps for the AKT and the Shipibo terminology. Yet another kin term map that also shows structural properties unlike these three terminologies can be seen with the kin term map for the Kariera terminology (see Figure 5). These differences in terminology structure can be related to differences in some aspects of their respective forms of social organization.

Relationship Between Terminology Structure and Social Organization

The ladder-like structure in the AKT (see Figure 2), which is derived from a single line of ascending *parent* products and descending *child* products, makes evident the

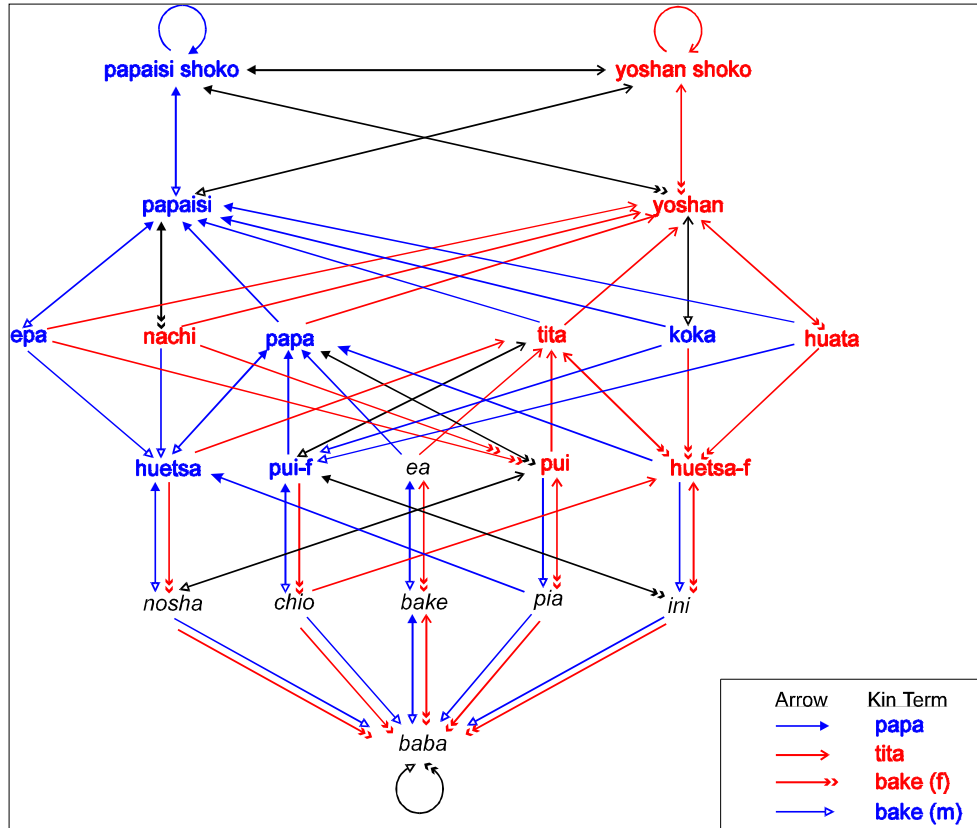


Figure 3: Kin term map for the Shipibo kinship terminology. The parental terms are *papa* (‘father’) and *tita* (‘mother’) and reciprocally *bake* (‘child’). *Ea* is the central, self position. The kin terms *pui* and *huetsa* depend on the sex of speaker. The suffix, *-f*, has been added to denote the usage of these terms by a female speaker. Kin terms are from Behrens 1984.

way in which the terminology conceptually expresses a lineal structure reflected in the (previously traditional) practice among English speakers of a woman and her children taking on the name of her husband even though lineal descent groups are not culturally recognized. The terminology already provides a structural model for vertical relations, hence the lineal device of tracing to a common ancestor for defining the vertical dimension is not needed. Horizontally, the terminology structures kin into “lines.” Accordingly, one measure of kinship “closeness” would be the number of lines that are crossed to reach a term for someone in one’s own generation: siblings are closer relatives than first cousins, who are closer relatives than second cousins, and so on. By this criterion, nephews and nieces should be closer relatives than aunts and uncles and this is the case in Canadian immigration law for sponsorship: “The relationship between the Sponsor and the Sponsored Person ... must be one of the following ... [b]rother, sister, *nephew*, *niece* ...” (Anonymous 2012, emphasis added). Though parents are also included as possible Sponsored Persons, uncles and aunts are not.

The symmetry of the Shipibo terminology (see Figure 3) is reflected in the symmetry of the women’s designs used to decorate pottery, clothing, faces and other parts of the body: “the intricate *permutations of symmetry* and tessellations were common knowl-

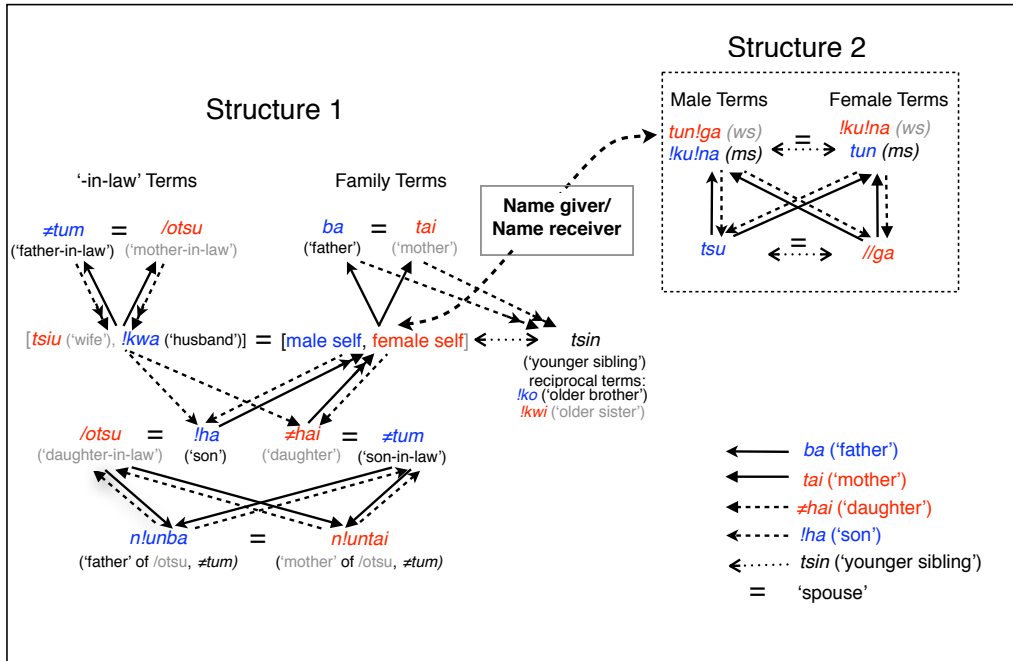


Figure 4: Kin term map for the !Kung san kinship terminology. Structure 1 has the kin terms for the family positions and Structure 2 encompasses all other kinship positions. The two structures are linked by the name-giver/name-receiver relationship. Kin terms are from Marshall 1976.

edge and skills ... with which the Shipibo women artists effortlessly expelled from their imaginations the most affecting and intricate arrays” (Roe 2004:240, emphasis added). The symmetry is expressed through a continuous line depicting the forms making up the symmetry of the design, a continuity that relates to therapeutic aspects of curing and bewitching shamanistic practices (Roe 2004:254).

Another dimension for the Shipibo where we find a parallel between the structure of terminologies and other conceptualizations is in their distinction between, and integration of, a male and a female domain. While many terminologies have terms whose meaning depends on the sex of speaker, these usually reflect a structural division into male terms and female terms (see Read 2007; when the same lexeme is used by both males and females, difference in meaning arises from whether the meaning is by reference to the male structure or to the female structure of kin terms). The male-female distinction among the Shipibo kin terms has a different structural basis. A single structure accounts for all the terms, whether male marked or female marked, but unambiguous mapping of the terms onto genealogical positions requires, for some of the terms, that the sex of speaker be taken into account. It is precisely for these terms where the meaning of a term depends on the sex of speaker. To put it another way, the terminology includes both separation of male from female and their integration within the framework of a single structure. The same pattern is widespread in Shipibo life, as they are “[t]ied together by a pervasive sexual division of labor, an iron embrace of segregation of tools, tasks, and spaces, but *united by their mutual complementarity*” (Roe 2004:255, emphasis added).

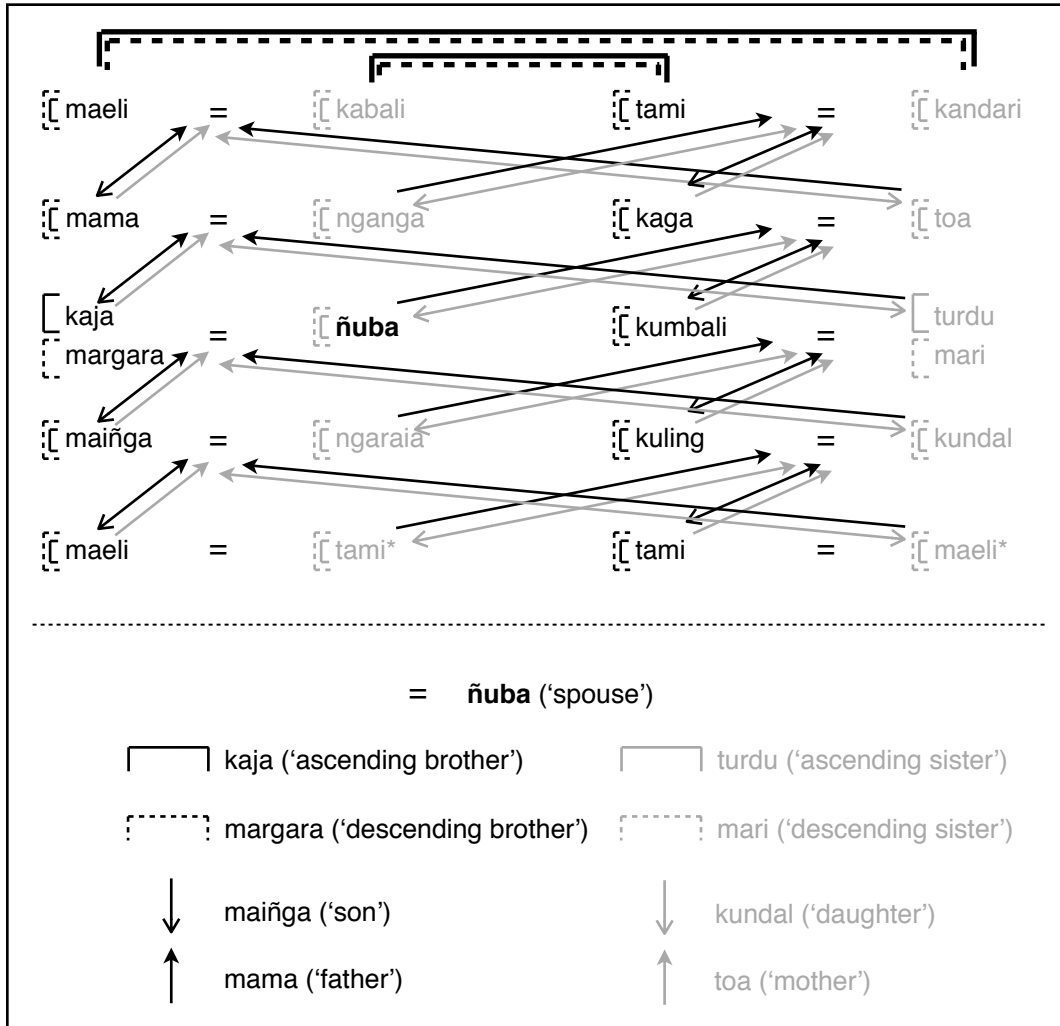


Figure 5: Kin term map for the Kariëra terminology from the perspective of a male speaker. Terminology has both parental (*mama* ['father'], *nganga* ['mother']) and sibling (*kaja* ['elder or ascending brother'], *turdu* ['elder or ascending sister']) primary terms. The term *ñuba* ['cross-cousin'] is used structurally for the spouse relation. Black: male marked terms; gray: female marked terms; and bold: neutral terms. The diagram is modified from Radcliffe-Brown 1913: Table 1.

This division into male versus female also relates to designs versus figures: “Thus the Shipibo ... form yet another representative of the cross-cultural trend statement *men : figural :: women : geometric designs*” (Roe 2004:275). The association of women with pattern expressed through design includes patterning in kinship and other aspects of cultural knowledge: “Women are repositories of traditional knowledge and I found that, when I asked men questions about kinship, language or folklore, they often deferred to their wives on these matters” (Behrens 1984:372).

The very different kin term map for the !Kung san (see Figure 4) emphasizes the horizontal dimension formed through sibling and spouse links and eliminates the vertical dimension through not having kin terms defined by kin term products such as *ba* of *ba* ('father' of 'father'). Instead, the vertical dimension is expressed through the name giver/

name receiver relationship that divorces the terminology from a genealogical structure. Conceptually removing the vertical dimension and replacing it with a horizontal dimension could hardly be structurally more complete and still have the functionality of a viable kinship terminology. The horizontal dimension for the kin terms carries over explicitly to the structure of residence groups. Residence groups are composed of families linked to one another through sibling and spouse links (Lee 1979, see especially Figure 3.6) and are the opposite of descent groups based on a vertical dimension formed through tracing to a common ancestor. The residence group is neither unilineally nor cognitively a descent group, as it is not the vertical dimension of ancestry that determines membership, but the horizontal dimension of sibling hood and spouse hood emphasized in the kinship terminology.

Finally, the relationship between the self-centered kinship terminology of the Kariera and their socio-centered social organization as a four-section system is well-known. The section system derives from “collapsing” the structure shown in Figure 5 vertically into two levels: 0, ± 2 generation terms versus ± 1 generation terms and horizontally into the first and fourth column of terms versus the second and third columns of terms, where the combined columns are composed of terms linked by a sibling relation. The intersection of these two “collapsings” yields four sets of kin terms that then divide the domain of kin into four groups. This is not yet a section system as it must be shown that the division of kin into four groups is the same regardless of the reference person. That the subjective grouping made by a single individual is an objective grouping for everyone is proven mathematically in Leaf and Read (2012). Thus the four-section system can be viewed as resulting from the Kariera recognizing a structure for the social organization of their society that emerges from the structural properties of their kinship terminology.

The associations between terminological structure and structures found in the forms of social organization seen in these examples is not a simple one of A causes B. Neither the terminology structure of the Kariera causes them to have a four-section system nor does the symmetry of the Shipibo terminology cause them to employ symmetry extensively in designs drawn by women. Rather, the connection is through patterning made available to them through the structure of their terminology. Patterning in one domain can be transformed into pattern in another domain. There is asymmetry in this relationship, though, as it is unlikely that patterning in designs or patterning in residence groups determines whether an ensemble of persons will have a kinship terminology with structure similar to already existing patterning in other domains. What these examples imply is that we, as culture-bearers, are aware, at some cognitive level, of patterning in the structure of our system of kinship relations that then becomes the basis, or a model, for constructing similar patterning in other domains (cf. Bennardo and Read 2007).

Generation of Structure

The structural differences among these kin term maps raises the question: Do the structural differences arise from factors extrinsic or intrinsic to the terminology? The answer is determined by asking yet another question: Can the structural form of a kinship terminology be generated, using kin term products, from a set of primary kin terms and structural

equations satisfied by the kin term products? The answer is yes, hence the structural differences are intrinsic. How the question is answered for each terminology provides us with the basis for forming a typology of kinship terminologies according to the generative structural logic underlying the form of a kinship terminology. While our formal representation of that generative structural logic is not at the level of the cognizant awareness of culture bearers, there must be neurological processes and functioning through which this structural logic is implemented. Whereas the kin term map provides us with a description of structure, the generative logic informs us that that structure arises from neurological processes acting on neurological representations corresponding to the primary concepts and relations structuring the system of kinship ideas and concepts expressed through a kinship terminology. Just as the grammar of a language is not a literal representation of what is occurring at the neurological level but expresses linguistic organization and structure produced through neurological processes, the same is must be true of the generative logic of a terminology. The computations we make are our way of representing to ourselves the outcomes of neurological processes even though do not yet know precisely what mental representations and what neurological processes are involved when we make a computation such as *child of uncle is cousin*. That we make such computations, and especially the fact that we agree on what such computations yield, requires that our overt, symbolic representations in the form of kin terms that we can manipulate consciously reflects something that is happening at a deeper, neurological level. We are not imposing structure on kinship terminologies when we uncover a generative logic, but making evident what already exists at the cognitive/neurological level.

The generative logic of kinship terminologies has now been worked out for enough terminologies to outline a typology for terminologies based on structural properties. Comparisons of terminology structures already provides new insights into relationships among kinship terminologies and to aspects of social systems related to the generative logic of kinship terminologies as discussed above.

One important result is that there is no universal structural form from which all extant kinship terminologies are evolutionarily derived (*contra* Allen 2008). Instead, there are at least three different structural forms for kinship terminologies, no one of which can be evolutionarily derived from the other two. The common basis for terminologies is not a particular structure but commonality in the way in which kinship terminology structures are generated (Read 2007; Leaf and Read 2012). Examples of these three different structures are provided by the AKT, the Karia and the !Kung san terminologies. Of these three terminologies, the !Kung san differs from the other two by having two structures joined through a naming relationship created when a newborn child is given the name of a close relation (Marshall 1976) (compare Figure 4 with Figures 2 and 5). In this terminology, kin term relations more distant than immediate family relations (see Structure 2 in Figure 4) do not have a fixed genealogical relation to a new born (Marshall 1976), hence these terms do not have a simple genealogical definition.² Instead, a child has a close relation with his/her name giver and then has kin relations with other individuals by reckoning kin relations from the perspective of one's name giver, using Structure 2 in Figure 4 (Marshall 1976).

For the other two terminologies, the Kariera terminology differs structurally from the AKT by having sibling terms, *kaja* and *turdu*, as generating terms, whereas *brother* or *sister* in the AKT are compound terms defined through the kin term product (*son* or *daughter*) of (*father* or *mother*). More precisely, the AKT has a single ascending kin term generator, *parent* (Read 1984; Read and Behrens 1990), whereas the Kariera terminology has both *mama* ('father') and *kaja* ('elder or ascending brother') as generating terms for the structure of male-marked ascending kin terms and structurally introduces female marked terms through an isomorphic copy of the structure of male marked terms (Leaf and Read 2012). This implies that the AKT can be transformed into the Kariera terminology (and vice-versa) only by redefining what are the primary terms from which each of the two structural forms can be generated, which is not a structural transformation but a redefinition of generating element(s).

Despite the structural differences among these three terminologies, there is a universal generative sequence for the construction of a kinship terminology structure, starting with *self* and one (or two) ascending generators. This sequence is as follows, using the idea that the structure of a kinship terminology is a series of layers.

1. Center Position

The center position of the terminology is a *self* position, which may be sex marked depending on the terminology (see Figure 6A).

2. Ascending Structure

Form a structure of ascending terms, where an ascending term expresses a kinship relation between ego and an alter who is before ego in a birth order sense. The primary ascending terms consist of a set of parental terms = {'father', 'mother', 'parent'} and sometimes a set of sibling terms = {'older or ascending brother', 'older or ascending sister', 'older or ascending sibling'}. (The single quotes indicate that the English words are the closest translation of the kin term being considered.) All terminologies use a parental term as an ascending generating term and generally use the kin term product to generate a structure of ascending terms, beginning with the self position (see Figure 6 B; the !Kung san terminology is an exception). The extensiveness of the ascending structure varies from the !Kung san terminology with an ascending structure consisting of a single step (see Structure 1 in Figure 4) to an unending ascending structure as occurs with the AKT and several of the other European terminologies. The classificatory terminologies differ by using a sibling term, as well as the parental term, to generate the structure of ascending terms.

Any limitations on the vertical extensiveness of the ascending structure are expressed through structural equations satisfied by kin term products using the primary ascending terms. The AKT has no such structural equations whereas the Shipibo terminology has the equation *papa* of *papa* of *papa* of *papa* = *papa* of *papa* of *papa* that provides a conceptual, vertical boundary for the ascending kin term structure. Terminologies with a sibling term as a generator will have structural equations such as 'older brother' of 'older brother' = 'older brother' expressing the reflexive property of a sibling term and an equation such as 'father' of 'older brother' = 'father' expressing the structural relationship

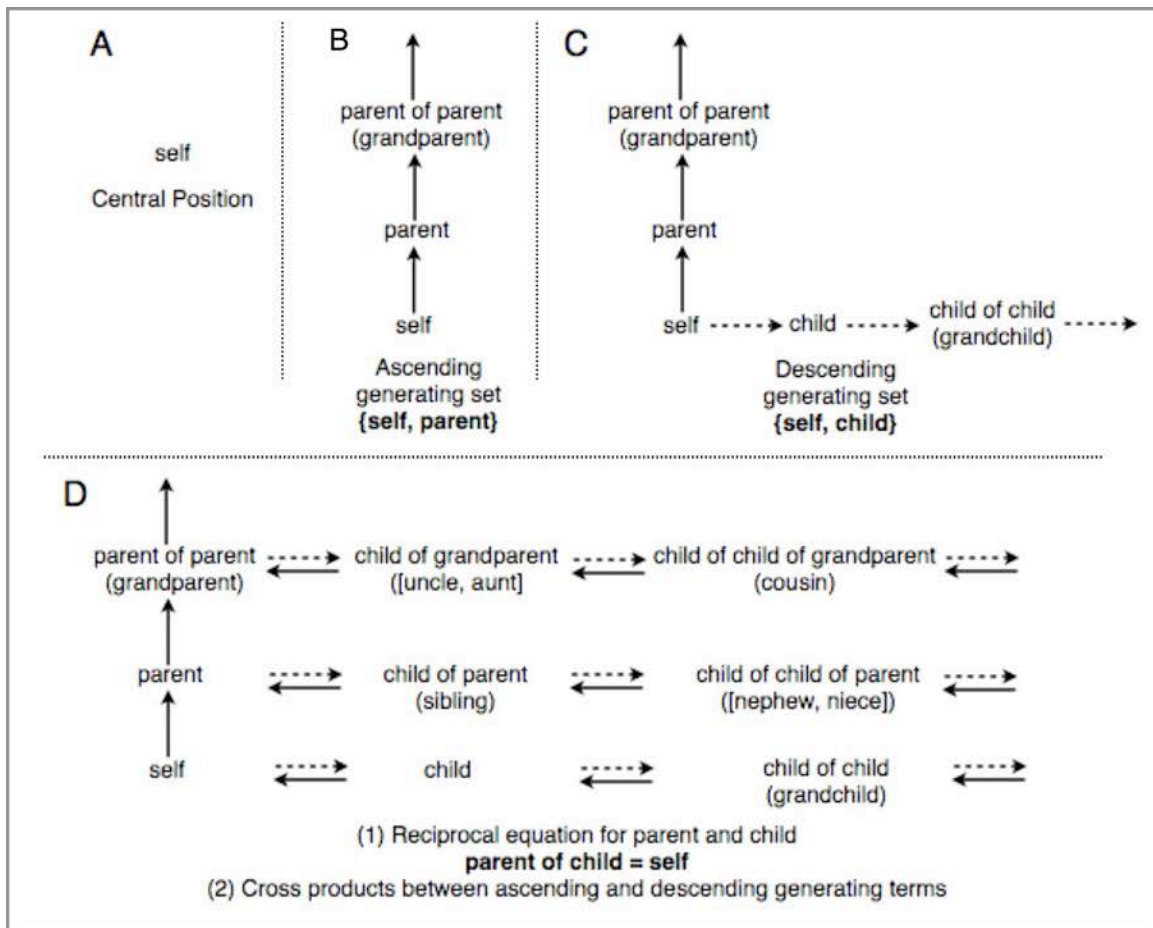


Figure 6: Outline of the first part of the procedure for generating a kinship terminology, illustrated with the American Kinship Terminology. (A) *Self* concept forms the central position of a terminology structure. (B) An ascending structure is generated from $\{self, parent\}$. (C) A descending structure based on $\{self, child\}$ is generated isomorphic to the ascending structure. (D) The structural equation *parent of child = self* defines *parent* and *self* to be reciprocal kin terms. Cross products between ascending and descending terms are formed and reduced using the equation for reciprocal generating terms. Each generated position corresponds to a kin term or a pair of kin terms, in the American Kinship Terminology.

between an ascending generating term such as ‘father’ and a sibling generating term such as ‘older brother’.

3. Descending Structure

The next layer is a descending structure isomorphic to the ascending structure, meaning that the descending structure has the same number of generators as the ascending structure. The descending structure uses the same *self* term as does the ascending structure. Each structural equation for the ascending structure is repeated as a structural equation for the descending structure, but written with the corresponding descending generator in place of an ascending generator (see Figure 6C). Thus, the AKT has a descending structure with generating term, *child*, in place of the generating term *parent* for the ascending

structure. There is no structural equation for the descending structure in the AKT since its ascending structure has no structural equation.

4. Reciprocity

Reciprocity, a central concept for kinship systems, is structurally expressed between an ascending generator and a descending generator by a structural equation of the form (*ascending generating term*) of (*descending generating term*) = *self* or, for the AKT the equation *parent of child* = *self* (see Figure 6D). The equation for the AKT is motivated by kin term products. If ego refers to alter 1 by the kin term *child* and alter 1 refers to alter 2 by the kin term *parent*, then alter 2 must be ego since in the construction at this point we do not yet have affinal relations and so ego refers to alter 2 by the term *self*, hence the equation *parent of child* = *self*. We also include all possible products between the ascending and the descending generating terms (see Figure 6D). For the AKT, the kin term products defined in this manner correspond to kin terms in the kinship terminology; e.g., *child of parent* = [*brother, sister*], *child of parent of parent* = [*uncle, aunt*], *child of child of parent of parent* = *cousin*, and so on.

5. Sex Marking

Next, sex differences among kin terms are introduced through one of two means. (A) Introduce sex marking attributes, call them M (male) and F (female), into the set of generating terms with appropriate structural equations such as $M \circ M = M = M \circ F$, $F \circ F = F = F \circ M$, and $K \circ M = K \circ F = K$, for any kin term K. Sex marking is represented by a product such as $M \circ K$ or $F \circ K$. For example, in the AKT, *parent* becomes sex marked by forming and labeling the products $M \circ \textit{parent} = \textit{father}$ and $F \circ \textit{parent} = \textit{mother}$. (B) Form an isomorphic copy of the ascending and descending structure, with the initial structure interpreted as male marked terms and the isomorphic copy as female marked terms (or vice-versa). The two structures are joined to form a single structure using terminology specific structural equations. This procedure is ubiquitous among the classificatory terminologies and occurs with some of the descriptive terminologies such as the Polish terminology (Lee, personal communication). There are several different ways the two structures can be joined and three of these ways create the Kariera-like terminologies (Leaf and Read 2012), the Polynesian and other Oceanic terminologies (Read 2013), and the Dravidian terminologies (Read 2010).

6. Affinal Terms

Lastly, affinal terms are introduced, either by introducing a spouse generating term in the structure (along with appropriate structural equations such as $S \circ S = S$ [read: “spouse of spouse is spouse”] and $S \circ P = S$ [read: “spouse of parent is parent”], where S is the spouse generating term and P is the ascending generating term), or by identifying an existing term as a spouse term as occurs in terminologies such as the Kariera terminology where *ñuna* (‘cross-cousin’) is the term used to refer to spouse by a male or a female speaker (see Figure 5).

7. Rules For Local Structure

Additional structural properties may be introduced, such as, for the AKT where limitations are placed on which terms remain sex marked and there are structural rules for the elaborated cousin terms. In the AKT, a kin term, K , remains sex marked only if $S \circ K$ is a kin term (read: “Spouse of K is a kin term”) or $S \circ K^r$ is a kin term (read: “Spouse of the reciprocal term for K is a kin term”); e.g., the sex marked kin terms *father*, *mother*, *son* and *daughter* are in the AKT since *spouse of father = mother*, *spouse of mother = father* and *son* and *daughter* are the reciprocal terms for *father* and *mother*. In contrast, *cousin* is not sex marked since *spouse of cousin* is (logically) not a kin term.

8. Cultural Modifications

Finally, local modification of the terminology may be made using cultural criteria external to the terminology, such as the kin term ‘younger brother’ of ‘mother’ in the Tongan terminology is introduced for reasons relating to inheritance (Bennardo and Read 2007).

With this as background, we can now outline an initial typology for kinship terminologies.

Typology for Terminologies

Level 1: Variation in the content of Generating Sets

The first division in the typology will be based on differences in the content of the generating set for the ascending structure. We will distinguish between terminologies with a single parental (ascending) generating term and terminologies with both a parental generating term and an ascending sibling generating term. This distinction corresponds to Morgan’s descriptive versus classificatory terminologies, respectively (Read 2007; Read and Behrens 1990; Bennardo and Read 2007; Leaf and Read 2012). The correspondence between generating sets and descriptive and classificatory terminologies (often referred to as bifurcate merging terminologies) arises for the following two reasons. First, when there is a single parental generating term, it logically follows that collateral kin term positions will be distinguished from lineal kin term positions as long as there is no structural equation of the form *descending generator of ascending generator = self* (see Figures 2-3). Second, when there is both a parental generating term and a sibling generating term, the kin term product equations ‘brother’ of ‘father’ = ‘father’ and ‘sister’ of ‘mother’ = ‘mother’ that characterize classificatory terminologies (see Figure 5) are the logical consequence of the general procedure for generating a kinship terminology as discussed above (for details, see Read and Behrens 1990; Bennardo and Read 2007; Read 2007; Leaf and Read 2012).

That the concept of sibling can give rise to a generating term is corroborated by ethnographic observations of indigenous groups with classificatory terminologies such as the Kaluli of New Guinea who, when working out kin relations, “frequently invoke a sibling relationship as the link that explains the application of a term--’I call him brother because my father calls his father brother.’ ... the *sibling relationship takes precedence over descent* whenever the principles are in conflict” (Schieffelin 1976:54, 55, emphasis in the original). Similarly, the Tangu of New Guinea consider that “siblingship is the determinant that descent [parent-child links] might have been expected to be ... descent was

probably always calculated from siblingship ... and siblingship rather than descent always provided the definitive norms of social behavior" (Burrige 1959/60:128, 130). In the Polynesian and Oceanic area there are numerous references to the centrality of siblings, especially siblings of opposite sex, in a group's cultural conceptualizations regarding kin relations (Marshall 1983).

Not all terminologies are descriptive or classificatory. The !Kung san terminology is neither one nor the other since the terms for the family relations are not used to generate additional kin terms; for example, there is neither a kin term corresponding to *ba* ('father') of *ba* ('father') nor to *tai* ('mother') of *tai* ('mother'). Instead, as discussed above, the terminology has two disjoint structures linked by the name giver/name receiver relationship made active when naming a newborn child. Consequently, there are two sets of generating elements, each corresponding to one of these two structures.

Since there is no structural transformation connecting these three structural forms, we include (at least) three distinct root structures for kinship terminologies: (1) descriptive terminology structures with a single parental generating term, (2) classificatory terminology structures with a parental generating term and a sibling generating term, and (3) other terminology structures such as the !Kung san terminology. Under (3), we leave open the possibility that other structural forms may be identified as the generative logic for a wider variety of terminologies is worked out.

Now consider variants on the generating set for the ascending structure. First we consider the descriptive terminologies.

Descriptive Terminologies

Level 2a: Sex Marking of Generating Terms

Variants include:

- (1) a generating set where the parental term is not sex marked;

e.g., $\{self, parent\}$ is the generating set for the AKT ascending structure and parent is not sex marked (see Figure 2),

- (2) a generating set where the *self* term and the parental term are already sex marked, so that there will (initially) be generating sets for the ascending male terms and for the ascending female terms;

e.g., $\{male\ self, papa\ ('father')\}$, $\{male\ self, bap\ ('father')\}$, and $\{male\ self, ojciec\ ('father')\}$ are the respective generating sets for the male ascending terms in the Shipibo (Figure 3), Punjabi (Figure 7), and Polish terminology (Figure 8). The corresponding generating sets for the ascending female terms for these three terminologies are $\{female\ self, tita\ ('mother')\}$, $\{female\ self, ma\ ('mother')\}$, and $\{female\ self, matka\ ('mother')\}$, respectively.

Level 2b: Ascending Structural Equations

The ascending structure may have different structural equations. For example, the Shipibo terminology has the boundary condition (using *ba* ['father']): *ba* of *ba* of *ba* of

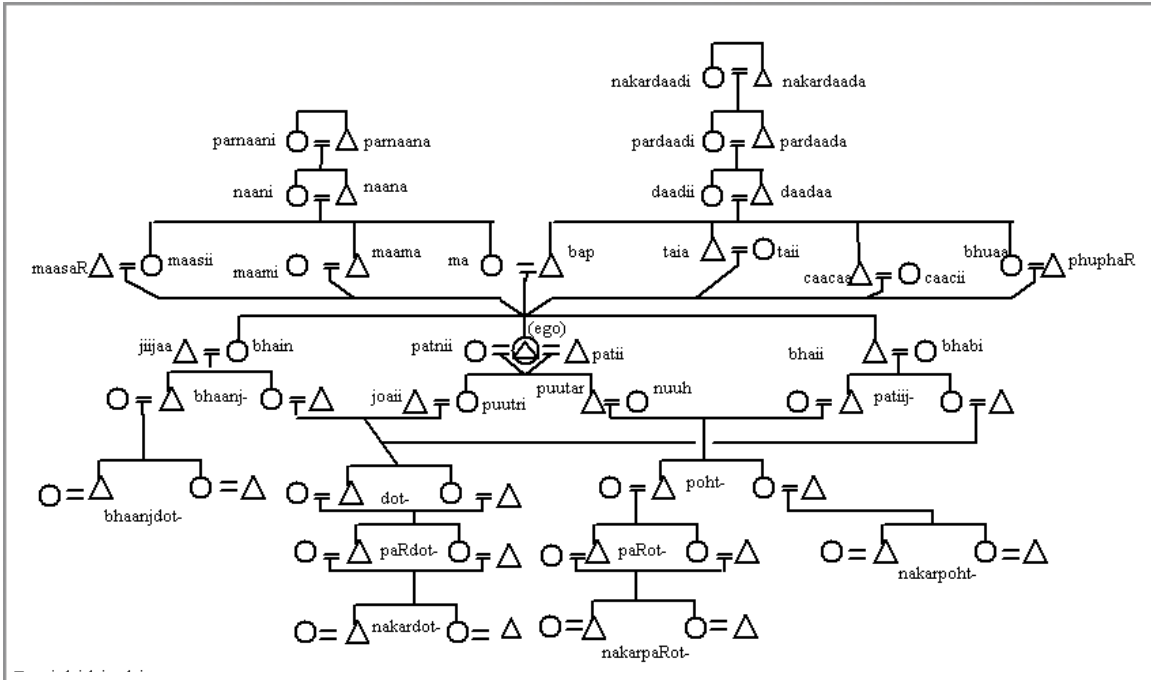


Figure 7: Kinship map for the Punjabi terminology (Leaf 1971). The diagram uses a kinship map rather than a kin term map. The kinship map contains the same structural information as does the kin term map, but is constructed directly from the elicitation procedure using the method given in Leaf 2006. Note that the patrilateral terms extend upward one more generation than do the matrilateral terms.

ba = *ba* of *ba* of *ba*. The Punjabi terminology has a different boundary condition (using *bap* ['father']): *bap* of *bap* of *bap* of *bap* of *bap* = 0. The difference in boundary conditions relates to differences in whether ancestors are considered to be relatives in the sense of kin terms used to refer to them (Shipibo) or not (Punjabi) (Leaf and Read 2012).

Level 3: Sex Marking of Kin Terms

At the next level in the typology are differences in the way sex marking of kin terms is implemented, depending on whether the initial generating elements are sex marked. For the AKT, what are initially neutral generating terms are bifurcated into sex marked terms; e.g., *parent* → [*mother*, *father*] by incorporating sex marking elements as discussed above so that *mother* = *F* o *parent* and *father* = *M* o *parent*. In the Polish, Shipibo and Punjabi terminologies, the ascending + descending structure based on male terms and the isomorphic copy of this structure based on female terms are already disjoint structures of male terms and female terms. For terminologies like this, the sex marked terms initially form disjoint sets and so they must be joined to form a single structure of male marked and female marked terms. There are several ways that this has been implemented, depending on the cultural context, with each way based on the fact that the structure of terms marked with a single sex includes a sex marked self position, either *male self* or *female self* depending on whether it is part of a structure of male terms or a structure of female terms.

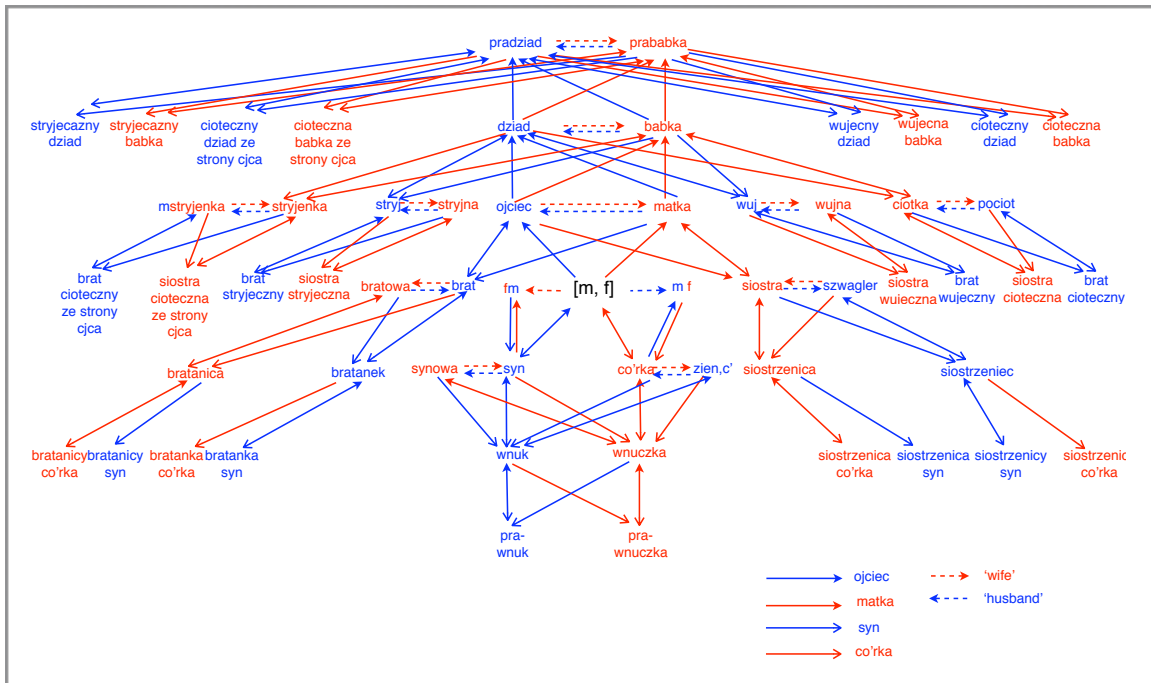


Figure 8: Kin term map of the Polish terminology. Primary generating terms are *ojciec* (‘father’) and *male self*. Based on personal communications with Jacob Lee (2004, 2009).

One way a single structure is formed is by taking the set union of the two structures and introducing a covering self term for the *male self* and *female self* terms, so that *self* = [*female self*, *male self*] becomes the central position in both the structure of male terms and in the structure of female terms. Then structural equations are added, as appropriate, for products of male marked generating terms and female marked generating terms. Examples of using this method for joining the structures are the Shipibo terminology (Figure 3) and the Punjabi terminology (Figure 7).³

A second way, which applies to the Polish terminology, is through interpreting each of *male self* and *female self* as a kin term from the viewpoint of a speaker with the opposite sex of the sex marked *self* term. For the Polish terminology structure, *female self* is interpreted as *żona* (‘wife’) for a male speaker and *male self* is interpreted as *mąż* (‘husband’) for a female speaker. *żona* is formally represented by the kin term product equation *żona* = *female self* of *male self* and *mąż* by the kin term product equation *mąż* = *male self* of *female self* (see Figure 8). Thus neither *żona* nor *mąż* are additional, primary generating terms.

Additional differences may be introduced in the typology relating to the way affinal terms and other structural properties are introduced into the terminology structure. These are not discussed here but see Read 2007; Read and Behrens 1990; and Leaf and Read 2012 for details.

Classificatory Terminologies

Level 2a: Sex Marking of Generating Terms

Classificatory terminologies consider to date are based on sex marked generating terms, including the *self* term, though it may yet be found that some classificatory terminologies make use of non-sex marked generating terms.

Level 2b: Ascending Structural Equations

For classificatory terminologies, the ascending structural equations imply (see Bennardo and Read 2007; Leaf and Read 2012 for details), when constructing the isomorphic descending structure, both the equations ‘brother’ of ‘father’ = ‘father’ and ‘son’ of ‘brother’ = ‘son’ and an ‘older’/‘younger’ distinction (more accurately, an ‘ascending’/‘descending’ distinction; see Leaf and Read 2012) for ‘brother’ terms. Inclusion of a sibling generating term accounts for the the distinction between descriptive and classificatory terminologies and this difference in a generating set provides an unambiguous definition for each of these two classes of terminologies in place of Morgan’s ambiguous definition based on difference as to whether the kin terms distinguish collateral from lineal relations.

Level 3: Sex Marking of Kin Terms

Sex marking of kin terms is by making an isomorphic copy of the structure of ascending + descending kin terms. To date, three ways have been determined for joining the structure of male terms and of female terms into a single structure.

Variant (1)--Oceanic Terminologies with *male self* for a female speaker and *female self* for a male speaker interpreted as ‘cross-sex sibling’ terms. As a consequence, there is no ‘older’/‘younger’ distinction for ‘cross-sex sibling’ terms. This leads to many of the Oceanic classificatory terminologies (see Figure 9). Additional variants relate to alternative ways in which reciprocity of the sibling terms is defined structurally and account for variation in the structural form of the sibling terms in the Polynesian terminologies that, in turn, leads to a historical reconstruction consistent with the geographical and time sequence for the colonization of the Polynesian Islands (Read 2013).

Variant (2)--Australian Kariera-like terminologies with and ‘older’/‘younger’ distinction for sibling terms regardless of sex of speaker. The linkage between the structures of male marked and female marked terms is through the ‘older/younger same sex sibling’ terms. In this case there will be an ‘older’/‘younger’ distinction for ‘cross-sex sibling’ terms as occurs in the Kariera terminology (Figure 5). The logic of generating the terminology has two sub-variants: (A) terminologies where the equation ‘spouse’ = ‘cross-cousin’ is necessary for the logic of the terminology structure; e.g., the Kariera and other, similar Australian terminologies, and (B) terminologies that reverse the structural position for the male and female ‘cross-cousin’ terms in sub-variant (A) and thereby remove ‘spouse’ = ‘cross-cousin’ as a necessary equation for the logic of the terminology structure. The Iroquois terminology with its lack of a ‘cross-cousin’ marriage rule is generated in this manner.

Variant (3)--Dravidian terminologies (see Figure 10) in which there are ‘older/younger cross-cousin’ terms. The male and female structures are made into a single structure by introducing *self* as a covering term for *female self* and *male self*: *self* → [*fe-*

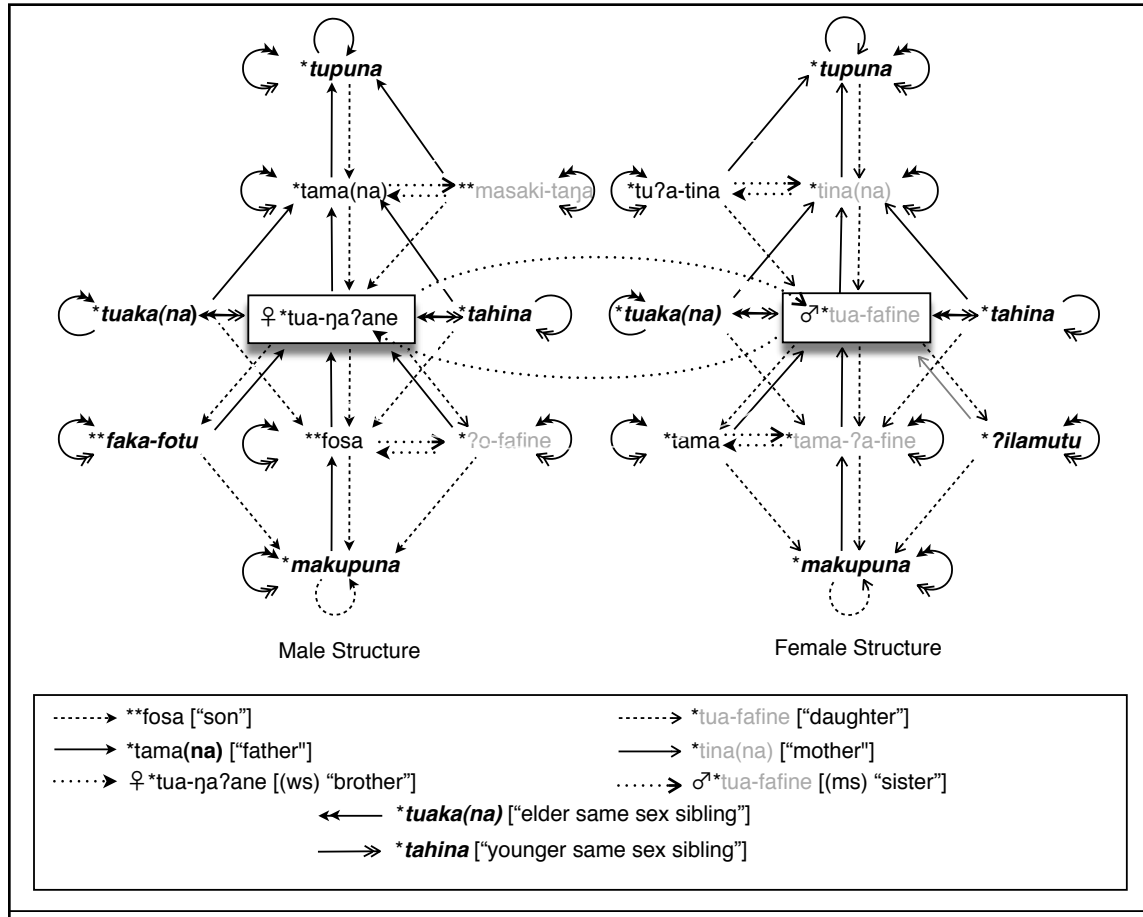


Figure 9: Kin term map for the *Proto-Polynesian terminology reconstructed linguistically from changes in the morphological form of kin terms. However, the structural form is assumed and not demonstrated. Feasible evolutionary changes in structure, the geographical pattern of settlement of the Pacific Islands and the current distribution of structurally different terminologies imply that there are two root terminologies and the structure shown here is derivative, not a root terminology (Read 2013). There is a hidden *male self* position beneath the box in the male structure and a hidden *female self* position beneath the box in the female structure. Except for the two long, curved-dotted arrows in the center of the figure, all arrows pointing to or originating at the center position for each of the two structures involve the *male self* and the *female self* position. For example, in the male structure, the horizontal, double-headed arrow pointing to *tahina originates at the *male self* position (i.e., *tahina of male self = *tahina) and the horizontal, double-headed arrow originating at *tahina points to male self (i.e., *tuaka(na) of *tahina is male self). Terms in boxes show the connection between the male structure and the female structure via *male self* becoming *tua-ŋaʔane ('brother') for the *female self* position and *female self* becoming *tua-fafine ('sister') for the *male self* position.

male self, male self]. An isomorphic copy of the structure of female + male terms becomes a structure of affinal terms for the terminology and then the structure of female + male terms is structurally joined with the structure of affinal male + affinal female terms through spouse kin term products between terms in the structure of female+male terms and the term in the corresponding position in the structure of affinal male+female terms.

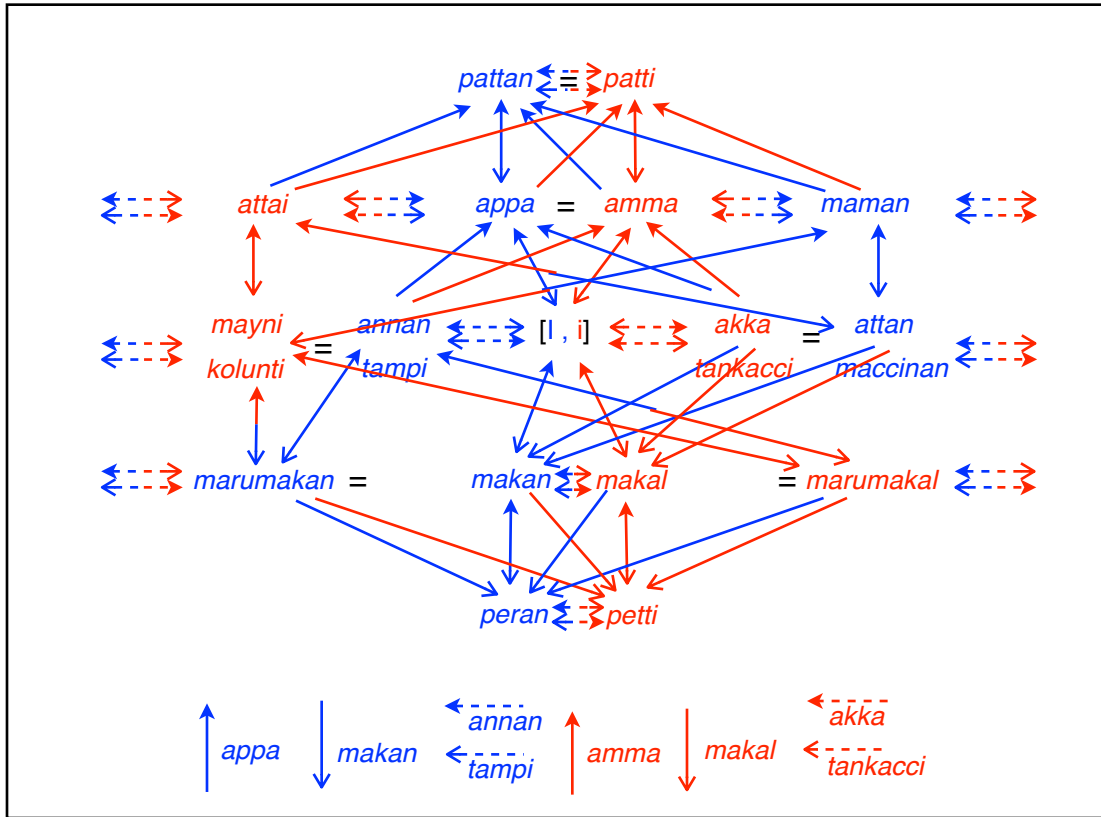


Figure 10: Kin term map of a Dravidian terminology from the perspective of female self. The male perspectives is the same except for reversing the terms in the -1 generation. Horizontal arrows on the extreme right and left side of the kin term map wrap around to the other side. Reflexive arrows not shown. Solid arrow heads are ascending generating terms and open arrow heads are descending generating terms. The “=” denotes terms connected by a kin term product with a spouse term. Kin terms are from Trautmann 1981.

For example, ‘wife’ of ‘older brother/younger brother’ of *self* = ‘older sister/younger sister’ of ‘spouse’ of *self* in the Dravidian terminologies (see Read 2010 for details). The construction sequence shows that the Dravidian terminologies have an emergent ‘cross-cousin’ marriage structure and this accounts for the substantial difference discussed by Dumont (1953) for what is meant by a ‘cross-cousin’ marriage rule when comparing the Karia terminology with the Dravidian terminologies.

Conclusion

The kin term products that culture-bearers use in computing kin relationships make it evident that there is structure to the terms in a kinship terminologies independent of mapping kin terms onto genealogical positions. We make that structure visually evident through a kin term map. We then work out whether there is a generative logic for the kinship terminology structure. If so (and this has been the case for all terminologies considered to date), we are determining, through generating terms, structural equations, and structural ways to join distinct structures into a single structure, the structural properties that give rise to the structural form of a terminology through kin term products. This

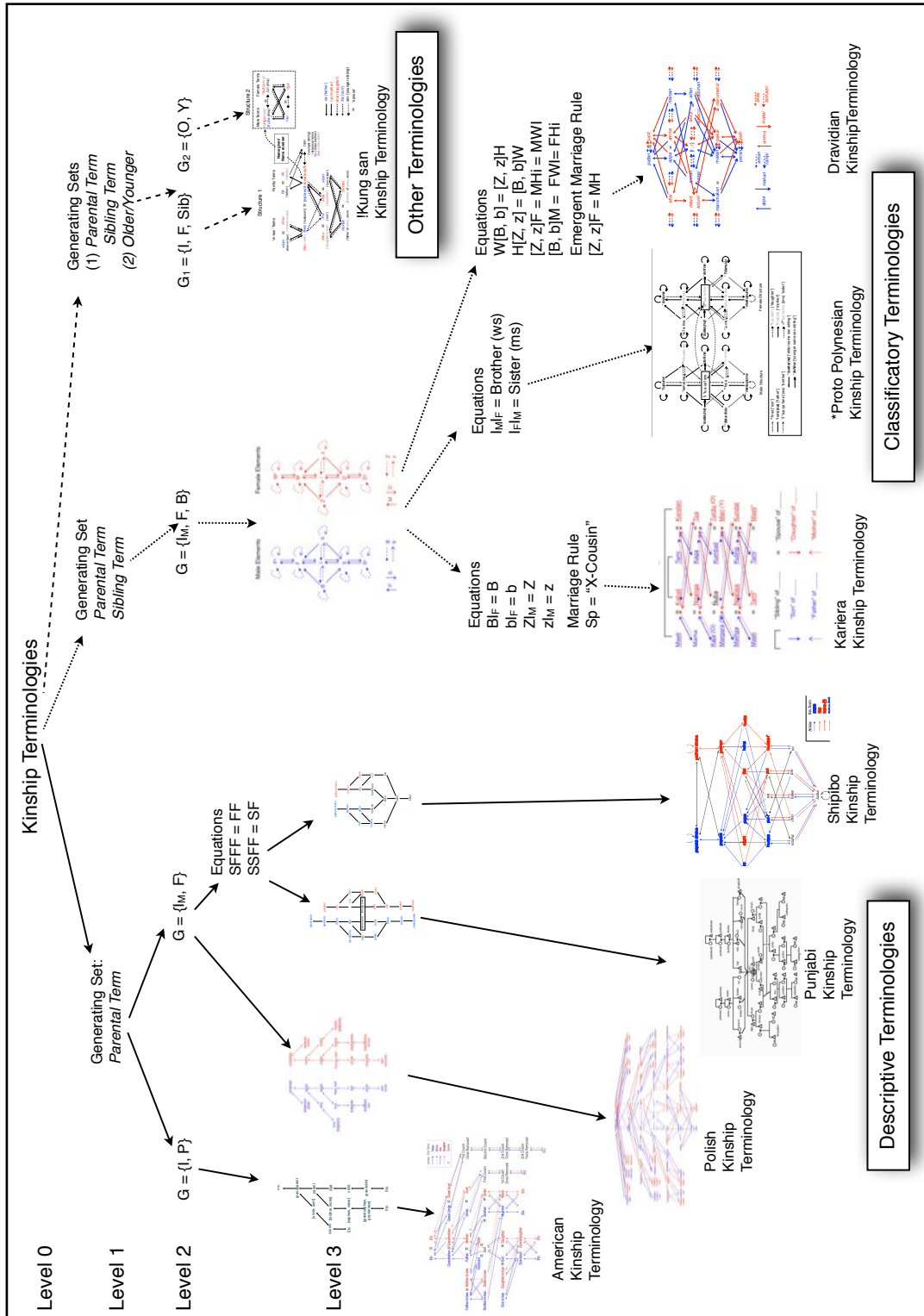


Figure 11: Typology for descriptive, classificatory and other terminologies. Level 1: Variation in generating set for the terminology. Level 2: Variation in sex marking of generating terms. Level 3: Variation in sex marking of kin terms and linking disjoint structures of male marked and female marked kin terms.

provides us with the foundation for working out a typology of kinship terminologies based on the properties responsible for the structural differences among kinship terminologies, hence to a typology that ensures that the terminologies grouped together in the typology are homogeneous with respect to the structural properties that determine the form of a kinship terminology (see Figure 11). This makes possible a more meaningful, cross-cultural comparison of kinship terminologies and provides a sounder foundation than has been available previously for working out the relationship between terminology structure and form of social organization as discussed above. Structural comparison invites diachronic and not just synchronic comparison. Some changes in structure are more plausible than others; e.g., dropping the rule in the AKT for terms where sex marking is preserved could, from a structural viewpoint, easily be dropped, thereby leading to a terminology with all kin terms sex marked.⁴ Changing a Kariera-like terminology with terms that incorporate an ‘older/younger’ distinction for sibling regardless of the sex of speaker to a Polynesian-like terminology in which that distinction only occurs among same-sex sibling terms is not a matter of “erasing” the distinction on opposite -sex sibling terms, but requires restructuring the way the structure of male terms and the structure of female terms are joined together to form a single structure, hence is a structurally more complex transformation. Just as evolutionary patterns can be worked out linguistically from changes in word forms, evolutionary patterns can be worked out from changes in structural forms, as Read (2013) has shown for the Polynesian terminologies. Even more broadly, working out the structural logic of a terminology makes explicit what is meant by the oft-repeated claim that culture is a constructed reality, for the kin relations expressed through a kinship terminology are both “real” for the users of the terminology, yet constructed through a generative logic acting on the cultural knowledge embedded in a kinship terminology.

¹ In genealogical equation form the types are as follows; Generation: $FB = F = MB$, $FZ = M = MZ$; Bifurcate Merging: $FB = F \neq MB$, $MZ = M \neq FZ$; Bifurcate Collateral: $FB \neq F \neq MB$, $FZ \neq M \neq MZ$; and Lineal: $FB = MB \neq F$, $FZ = MZ \neq M$.

² Structure 2 has the structural form of the tetradic structure defined by Allen (1998), but differs since it neither encompasses the entire society as is assumed by Allen for the tetradic structure nor is it sociocentric. Allen assumes that kinship terminologies are derived from something like the sociocentric four-section system that is part of the Kariera social organization, but the Kariera four-section system is derived from the kinship terminology and not the reverse (Leaf and Read 2012). No extant kinship terminology has yet been identified that has a structure reflecting the tetradic structure that is allegedly the root of all kinship terminologies. We do not need to posit root terminology structures without evidence since the structural forms represented by the AKT, Kariera and !Kung san terminologies are the structural consequence of straightforward differences that have ethnographic support, such as whether a sibling term is a generating term or not (descriptive versus classificatory terminologies) or whether the terminology structure distinguishes between terms relating to the family space and terms relating to other positions along with a structural means for connecting these two structures together (the !Kung san terminology with the naming relationship). There is no a priori reason why there must be a single, root terminology structure for all kinship terminologies as multiple origins with different structural forms is possible.

³ When working out the structure of kinship terminologies initially, the various structural properties and distinctions discussed here had to be worked out abductively from structures displayed in kin term maps. In doing this, I drew upon my knowledge as a mathematician regarding generating structures as abstract algebras since the set of kin terms from a terminology along with the kin term product satisfy the definition of an abstract algebra. Some of the kinship structural properties correspond to properties of abstract algebras, such as the structure of ascending and descending terms having the form of an algebra known as a semigroup; in particular, the structure shown in Figure 6D is known as a bicyclic semigroup in the semigroup literature. Other structural properties are specific to the domain of kinship terminologies. The abduction process is aided by the fact that a wrong guess as to a structural property is made evident through the fact that the structure generated using that wrong guess diverges from the kin term map as its structural implications are worked out. Trying to generate a classificatory terminology, for example, using a single ascending generating element fails to generate fundamental properties of the classificatory terminologies such as the terminologically recognized ‘older or ascending’/‘younger or descending’ sibling terms without engaging in *ad hoc* procedures such as simply imposing that distinction even though there is no ethnographic evidence showing that the users of the terminology conceptualize sibling terms in that manner. The properties discussed here are those that have been found to “work” in that they generate the structure of the terminology without *ad hoc* equations or other properties being added to force agreement between the analytically generated structure and the empirically observed structure displayed in the kin term map (*contra* Jones 2011). The argument being made here is falsifiable in a Popperian sense. One only needs to find a terminology with structure that cannot be generated except by including properties motivated solely as a way to force agreement between the generated structure and the empirical structure.

⁴ We have not considered the reasons why the sex rule exists for the AKT in the first place and those reasons may place constraints on possible changes in the sex rule independent of the fact that such a change does not pose any significant structural constraints. The kinship domain is a complex one where multiple cultural idea systems come into play (Leaf and Read 2012) and this affects the likelihood of structural changes regardless of their feasibility.

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